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NOTES ON PUERTO RICAN SIMULIIDAE FROM LIGHT TRAPS

(Diptera)

By Irving Fox, *School of Medicine, University of Puerto Rico, San Juan*

Authorities differ in regard to the use of light traps in population studies in Simuliidae. Dr. Dalmat (1950) indicates that they are not applicable because of the daytime activity of blackflies, but Dr. Frost (1949) demonstrated that they were of value in obtaining information on abundance and distribution. This latter point of view has been substantiated in Puerto Rico where light traps disclosed the presence of an undescribed species and gave interesting data on the known species. Collections were studied from two New Jersey type light traps run routinely at Henry Barracks, an Army post near the town proper of Cayey in the central mountainous region of Puerto Rico, during the period Sept. 20, 1949 to Jan. 2, 1952. From material taken in a total of 1540 trap-nights, there were identified 966 specimens of Simuliidae of which 753 were *Simulium haematopotum* Malloch, 189 were *S. quadrivittatum* Loew and 24 were *S. wolcotti*, a new species.

In the literature one finds four names of Simuliidae indicated as pertaining to the Puerto Rican fauna: *Simulium quadrivittatum* Loew, *S. haematopotum* Malloch, *S. minusculum* Lutz and *S. amazonicum* Goeldi. However, it is unlikely that *minusculum* (regarded by Lutz himself as a synonym of *amazonicum*) occurs in Puerto Rico. The record is based on a determination of Aldrich from examples of a lot consisting of seven specimens collected May 2, 1922 by F. Seín at Río Piedras, P. R. Six of these specimens are still extant in the University of Puerto Rico Experiment Station and they were found to be *quadrivittatum*, a determination which was corroborated by Dr. Alan Stone.

Simulium quadrivittatum Loew

Figs. 1, 2

Simulium quadrivittatum Loew, 1862, Berliner Ent. Zeitscher. 6: 186;

Malloch, 1914, U. S. Dept. Agric. Bur. Ent. Tech. Serv. No. 26: 61; Wetmore, 1916, U. S. Dept. Agric. Bull. 32: 66; Root, 1922, Amer. Jour. Hyg. 2: 396; Wolcott, 1924, Jour. Dept. Agric. Porto Rico 7: 213; Bradt, 1932, Puerto Rico Jour. Pub. Health and Trop. Med. 8: 69; Wolcott, 1936, Univ. Puerto Rico Jour. Agric. 20: 333; Vargas, 1945, Inst. Salub. Enf. Trop. Mexico Monog. No. 1: 189, 218; Wolcott, 1951, Univ. Puerto Rico Jour. Agric. 32: 443.

Simulium minusculum Wolcott (not Lutz), 1924, Jour. Dept. Agric. Porto Rico 7: 213; Bradt, 1932, Puerto Rico Jour. Pub. Health and Trop. Med. 8: 77; Wolcott, 1936, Univ. Puerto Rico Jour. Agric. 20: 333; 1951, idem, 32: 443.

Simulium amazonicum Vargas (not Goeldi), 1945, Inst. Salub. Enf. Trop. Monog. No. 1: 112, 218 (in part).

Records.—This species has been reported from the following localities in Puerto Rico: Aguirre, Barranquitas, Bayamón, Cidra, Corozal, Guaynabo, Lares, Las Marías, Martín Peña, Río Piedras, San Sebastián and Utuado. To these records are added the following ones which are in addition to Henry Barracks: Adjuntas, biting man, 1951 (J. F. Maldonado); Canóvanas, biting man, April, 1952 (M. Slusser); Mayagüez, light trap, Feb. 15, 1952 (J. Maldonado Capriles).

Remarks.—Of the three species of *Simuliidae* known to occur in Puerto Rico, this is the one which commonly bites man.

Simulium haematopotum Malloch

Figs. 3, 4

Simulium haematopotum Malloch, 1914, U. S. Dept. Agric. Bur. Ent. Tech. Ser. No. 26: 62; Wolcott, 1924, Jour. Dept. Agric. Porto Rico 7: 213; Dyar and Shannon, 1927, Proc. U. S. Nat. Mus. 69: 38; Bradt, 1932, Puerto Rico Jour. Pub. Health and Trop. Med. 8: 77; Wolcott, 1936, Univ. Puerto Rico Jour. Agric. 20: 333; Vargas, 1945, Inst. Salub. Enf. Trop. México Monog. No. 1: 144, 218; Wolcott, 1951, Univ. Puerto Rico Jour. Agric. 32: 443.

Records.—The published Puerto Rican reports of this species are only from Río Piedras. The following records from light traps are in addition to Henry Barracks: Manatí, May, 1949 (J. W. H. Rehn); Losey Field, Jan. 13, 1950 (C. E. Kohler).

Remarks.—The early records which refer to this species as biting man in Puerto Rico are suspect because some of the original material still extant in the University of Puerto Rico Experiment Station Collection show misidentification, e.g. one specimen caught while feeding on the arm by R. T. Cotton at Río Piedras June 25, 1917 and determined by him as *S. haematopotum* proved to be *S. quadrivittatum*. The two species are only superficially similar and may be readily separated without recourse to genital characters by the thoracic patterns which are illustrated in figs. 1–4.

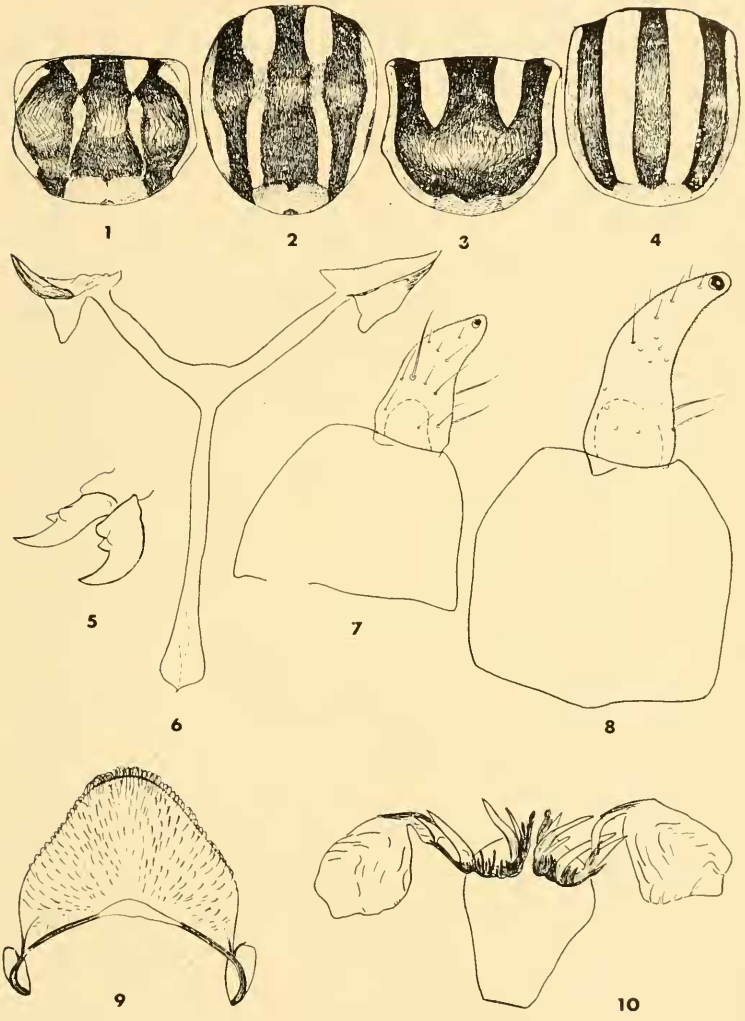

Fig. 1, *Simulium quadrivittatum* Loew, mesonotal pattern, male; fig. 2, the same, female; fig. 3, *S. haematopotum* Malloch, mesonotal pattern, male; fig. 4, the same, female; fig. 5, *S. wolcotti*, n. sp., hind tarsal claws; fig. 6, the same, genital fork; fig. 7, *S. ochraceum* (Walker), clasper and sidepiece; fig. 8, *S. wolcotti*, n. sp., clasper and sidepiece; fig. 9, the same, adminiculum; fig. 10, the same, adminicular arms. (Figs. 6–10 drawn to scale.)

Simulium (S.) wolcotti, new species

Figs. 5, 6, 8–10

Male.—About 2.0 mm. long. Head holoptic, the eyes large and the large facets extending down to the antennae, upper and lower portions black; clypeal area iridescent bluish; mouthparts black; antennae dusky distally, 11-segmented with the third segment much longer than the others. Scutum orange, yellow at the humeri; with two lanceolate silvery bands in the anterior half. Scutellum, postnotum and halteres concolorous with the scutum. Pleura dark brown, some portions bluish. Wings about 2.0 mm. long, a dense patch of dark setae at base of costa and on stem vein. Legs bicolorous, in general the femora light, the tibiae and tarsi black; calcipala well developed, pedisulcus deep. Abdomen dark, lighter basally. Clasper 0.104 mm. long; sidepiece 0.132 mm. long; adminiculum triangular with long setae forming a crown, 0.084 mm. long in the middle region and 0.118 mm. wide basally; adminicular arms with long prominent teeth, figs. 8–10.

Female.—About 2.5 mm. long. Head dichoptic, eyes and mouthparts black, frontal and clypeal areas iridescent bluish; antennae basically orange but the distal segments dusky, 11-segmented with the third segment larger than the ones which follow. Scutum, scutellum, halteres and pleura as in the male except that the silvery bands on the scutum are somewhat longer. Wings about 2.5 mm. long; Sc with a row of 6–13 widely separated dark setae in the basal three-fourths, but the rest glabrous. R_1 densely provided with macrotrichia and with an irregular row of black setae interspersed with spiniform ones along its entire length. Rs with a row of evenly separated dark setae beginning a short distance from its base and extending to its end. Sternal area dark brown. Legs in general with coxae and trochanters dusky, femora light, tibiae and tarsi black, the hind tibiae with a circumscribed wide light area beyond the basal third; calcipala well developed reaching to the deep pedisulcus; hind tarsal claws with a large subbasal tooth near which at certain angles there seems to be a smaller one, fig. 5. Abdomen black with some brown basally. Genital fork as shown in fig. 6; cercus rounded, pigmented; anal lobe large, cone-shaped.

Types.—All type specimens were collected by means of light traps at Henry Barracks, Puerto Rico and are in the entomological collection of the Department of Microbiology, School of Medicine, School of Tropical Medicine, San Juan, Puerto Rico. The male holotype taken in 1950 is pinned but its terminalia are mounted on a slide; the female allotype taken March 7, 1950 is pinned; there are also three male paratypes mounted on slides, two taken in 1950 and one Nov. 12, 1949 and four female paratypes mounted on slides taken in 1950.

Remarks.—Specimens of this new species were sent to two distinguished authorities on the Simuliidae, Dr. Alan Stone and Dr. Luis Vargas. Dr. Stone tentatively determined the species as *S. ochraceum* (Walker) suggesting that Dr. Vargas

be consulted, and the latter's valuable opinion (in a letter dated June 18, 1952) is as follows, "Efectivamente se trata de una especie muy semejante a *Simulium ochraceum*, principalmente por lo que se refiere a algunos caracteres externos, pero aún en éstos mismos se observan diferencias, ya que sus ejemplares tienen las patas bicoloridas y *ochraceum* no, pero las más grandes se notan en las genitalias de ambos sexos, así es de que con seguridad su material no es de *ochraceum*. Hemos revisado nuestro material y todo difiere de sus ejemplares, por lo tanto no sabríamos decirle con seguridad de qué especies se trata, pero encontramos que son muy parecidos, tanto en sus caracteres externos como genitales, con *Simulium ignescens* Roubaud, 1906 de la cual hace Wygodzinsky (1951) una buena redescripción."[1] Through Dr. Wygodzinsky's kindness specimens of *S. ignescens* were received and these also did not agree with the species described above as new.

S. wolcotti, n. sp. is closely related to *S. ochraceum* (Walker) but differs particularly in the male genitalia; its clasper although similar in shape is much larger as will be seen by comparing figs. 7 and 8, the former being from a specimen of *S. ochraceum* from Mexico determined by Dr. Vargas and the latter from the holotype of *S. wolcotti;* its adminiculum is also larger, different in shape and not bent distally to the degree that occurs in *ochraceum*. *S. ignescens* Roubaud and *S. dinellii* (Joan) so well described by Dr. Wygodzinsky (1950, 1951) are also similar to this new species but the latter differs from them in having silvery bands on the mesonotum and in the shape of the adminiculum.

ACKNOWLEDGMENTS

Thanks are expressed to Dr. Alan Stone, Dr. Luis Vargas and Dr. P. Wygodzinsky for helpful advice and generous exchanges of material; to the various commanders and chiefs of the laboratory service of the then Rodríguez General Hospital (U. S. Army) for securing light trap collections from Henry Barracks; to Miss Gloria A. Perkins, entomological technician, U. S. Army, for her careful curatorship of the

[1] "Really it is a question of a species similar to *Simulium ochraceum*, chiefly as regards some external characters, but even in these themselves differences are seen, since your specimens have bicolored legs and *ochraceum* has not, but the greatest differences are perceived in the genitalia of both sexes; and so your material certainly is not *ochraceum*. We have examined our material and all differ from your specimens therefore we could not tell you with certainty what species is concerned, but we find that your specimens are very similar both in the external characters and the genitalia to *Simulium ignescens* Roubaud, 1906, of which Wygodzinsky (1951) does a good redescription."

collections; and to Dr. George N. Wolcott, in whose honor the new species is named, for permission to study the collections in his charge.

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LABORATORY REARING OF CULEX SALINARIUS

(Diptera, Culicidae)[1]

By Robert Charles Wallis and Andrew Spielman, *Department of Parasitology, The Johns Hopkins School of Hygiene and Public Health, Baltimore, Md.*

Mosquito rearing in the laboratory has become increasingly important in recent years due to the large number of laboratory investigations made which have involved these important vectors of disease. In spite of the multiplying needs and demands of research involving mosquitoes, however, only a small number of species have been successfully colonized for use in laboratory studies; up to this time only four species of *Culex* have been reared in the laboratory.

During the past summer eight egg rafts of *Culex salinarius* Coquillett were collected from a fresh water drainage pond near the marshy, brackish-water shore of Breezy Point, Maryland. From these eggs, enough larvae were obtained to enable us to attempt colonization of this species. The purpose of this paper is to describe the successful laboratory rearing of *Culex salinarius*.

Carpenter *et al.* (1946) indicate that *salinarius* is not confined to coastal areas, but is generally distributed across the United States from Massachusetts west to Utah, and south to the Gulf Coast. Breeding places include both fresh and brack-

[1] This study was aided by a grant from the National Microbiological Institute, Bethesda, Md.

ish water in grassy pools, ditches, ponds, and artificial containers. The adult females readily bite man outdoors and frequently enter houses. Rozeboom (1942), while collecting in Oklahoma, took this mosquito feeding on man more often than any other *Culex*.

We found the shiny black egg rafts of *salinarius* on the water in the shade of overhanging vegetation. We picked them up on wet filter paper, and packed them carefully into pill boxes for transportation to the insectary. Only two rafts were intact at the end of the trip, however, due to their extremely fragile nature. We placed each raft in a separate glass finger bowl filled with tap water, and observed for hatching. At the end of two days, we collected about 150 first stage larvae. We transferred these to a white enameled photographic tray containing two liters of tap water, and reared as described by Trembley (1944 a,b), using rabbit pellet laboratory feed.

Pupation began on the tenth day, and we had collected approximately one hundred pupae by the fifteenth day after hatching. We placed these, in a shallow pan of water, in a large screened cage, size 3′3″x2′6″. The adults emerging into this cage were then maintained in the laboratory at a temperature of 27±3° C. A high humidity was maintained by partially covering three sides of it with flexible plastic sheets, and by applying wet paper toweling to the top of the cage. Later, additional moisture was added by placing in the cage an unglazed drain tile as described by Rozeboom (1936). With these provisions, the relative humidity, as measured by a sling psychrometer on five consecutive days, ranged from 52 to 78%, with a mean of 65%. The cage was located in the middle of a laboratory working compartment where illumination was fairly uniform, approximating one-fiftieth normal daylight.

Food for the adults was provided daily in the form of fresh apple slices, and, three days after emergence of the first adults, blood meals were offered daily by placing the bared forearm in the cage for fifteen minute intervals. At this time, a flat photographic tray containing three liters of tap water was placed in the cage to make available 144 square inches of oviposition area. During the first week of adult life of this initial laboratory-reared generation, little activity was observed. Except for a few females taking blood daily and feeding on the apple slice, the majority of the adults seemed to remain at rest on the sides of the cage. Mortality was high, and by the sixteenth day, only 38 females and about a dozen males remained alive. No copulation had been observed. Eighteen days after the emergence of the first adults, however, five small egg rafts were collected from the oviposition pan. Within three days, four of these rafts had hatched to provide a second generation of larvae.

At this time copulation in flight was observed. This mating flight was swift and brief, lasting only a few seconds, which probably had caused us not to observe it earlier. Perhaps, because of the few adults

present in the cage, no semblance of swarming was seen as observed in nature by Smith (1904). With the observation of copulation in the cage, and the obtaining of fertile egg rafts from the first laboratory generation of adults, hopes of establishing the colony were much brighter, for, as Huff (1944) indicates, this seems to be the chief difficulty in adapting *Culex* mosquitoes to laboratory rearing.

Careful rearing of the second generation larvae resulted in the addition of about three hundred more adults to the colony. Twenty-seven days later these adults had produced 45 egg rafts, of which 41 proved to be fertile. From them, a large third generation of larvae was obtained, insuring the propagation of the colony.

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A CHANGE OF NAME IN THE FAMILY REDUVIIDAE

Hemiptera

I have to thank my friend Professor R. F. Hussey of the Florida Southern College for kindly calling my attention to the preoccupation of *Saica fuscovittatus* Barber, 1914 by Stål. 1859. *Saica florida* is herewith proposed as a new name for the Floridian species.—Harry G. Barber, *U. S. Bureau of Entomology and Plant Quarantine.*